

REMARKS/ARGUMENTS

Favorable reconsideration of this application is respectfully requested in light of the following discussion.

Claims 1-20 are active in this application. No claims are amended, canceled, or added by the present Request for Reconsideration.

In the outstanding Office Action, Claims 1-20 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 5,461,357 to Yoshioka et al. (herein "Yoshioka"). Applicants respectfully traverse that rejection.

Claim 9 is directed to an image processing apparatus that includes, in part, a camera configured to input plural frame images serving as video images, a tracking unit, and a detector. The tracking unit is configured to detect a straight-line component in a specific direction from each frame image in the plural frame images. Further, the tracking unit is configured to generate an obstacle candidate area as an image area in the vicinity of the straight-line component, and to track the obstacle candidate area in an image succeeding each frame image in the plurality of frame images. The detector is configured to determine, using the tracking result of three or more obstacle candidate areas, whether the plural obstacle candidate areas belong to a specific plane, and to detect an obstacle based on the determination. Independent Claims 1 and 17 include similar features.

In a non-limiting embodiment, Applicants' Figure 1 shows an example of an image processing apparatus configured to detect an obstacle based on a determination as shown in the examples of Figures 3 and 4. According to this embodiment, an obstacle area tracking unit 11 includes a candidate area tracking unit 12 configured to detect a line segment in a specific direction in a detection area for detecting an obstacle. In this example, the specific direction is the horizontal direction, and the line segment detecting includes detecting a straight-line component in the horizontal direction, which may correspond to a ground line

between the road and a vehicle in front of the present vehicle or a window line of the vehicle in front (e.g., horizontal lines 34 in Applicants' Figure 3).

Further, as shown in Applicants' Figure 4, obstacle areas 41 may be generated in a vicinity of the straight-line component, which is the area above the detected straight-line. Finally, as shown in Applicants' Figures 4-6, the obstacle detector 14 included in the tracking unit 11 may determine whether plural obstacle candidate areas belong to a specific plane and detect an obstacle based on that determination. For example, a determination may be made as to whether the obstacle candidate areas belong to a vertical plane, in which case they may be associated with a moving vehicle, or the plural obstacle candidates may be determined to be part of the surface plane of the road in which case they may not be determined to be an obstacle.¹

Applicants respectfully submit that Yoshioka fails to teach or suggest each of the features of the independent claims. For example, Applicants respectfully submit that Yoshioka fails to teach or suggest an image processing apparatus that includes a tracking unit configured to detect a straight-line component in a specific direction, and Yoshioka also fails to teach or suggest a detector configured to use the tracking result of three or more obstacle candidate areas to determine whether the plural obstacle candidate areas belong to a specific plane and to detect an obstacle based on the determination.

Yoshioka describes an obstacle detection device for a vehicle that includes a scanning laser (i.e., radiation device 2) that scans a sector area with a sector beam.² Further, Yoshioka indicates that a distance between a vehicle and an obstacle is determined based on a time period from when the scanning laser irradiates a light until light is received at a receptor 3.³ Yoshioka also indicates that a controller 4 sets up a detection area for detecting an obstacle within the area scanned by the laser and splits the area into small split zones and ranks the

¹ Specification at page 6, lines 30-33, and page 9 at lines 3-13.

² Yoshioka at column 4, lines 11-14 and Figure 1.

³ Yoshioka at column 4, lines 14-21.

split zones with regard to a degree of danger.⁴ Thus, according to Yoshioka, a controller splits an area illuminated by a radar into plural zones (e.g., S1, S2, S3) and finds a closest obstacle to the vehicle for each of the split zones.⁵ The split zones of Yoshioka are specified by an expansion angle δ around a center axis of the split zone offset by an offset angle ϕ from a center of a path of the vehicle.⁶ In other words, Yoshioka determines a distance to plural obstacles in front of a vehicle using a laser range finder, divides a region scanned by the laser into plural split zones S1-S3, and ranks the danger of the closest obstacle in each split zone according to the rank of danger of the split zone.

However, Yoshioka fails to teach or suggest detecting an obstacle based on a determination of whether obstacle candidate areas belong to a specific plane. For example, even if one were to consider the split zones of Yoshioka to be similar to the claimed obstacle candidate areas, Yoshioka nevertheless fails to teach or suggest any determination of whether the split zones belong to a specific plane. Accordingly, Applicants respectfully submit that Yoshioka fails to teach or suggest an image processing apparatus including a detector “configured to determine, using the tracking result of three or more obstacle candidate areas, whether the plural obstacle candidate areas belong to a specific plane and configured to detect an obstacle based on the determination,” as recited in independent Claim 9, and as similarly recited in independent Claims 1 and 17.

In addition, Applicants respectfully submit that Yoshioka fails to teach or suggest a tracking unit configured to detect a straight line component in a specific direction from each frame image in a plurality of frame images from a camera. Yoshioka indicates that a camera 28 displays an area of width Q at a distance X forward of the vehicle 14 on a screen 29. Further, Yoshioka indicates that a discriminator 30 finds a location of a guardrail 25 and a

⁴ Yoshioka at column 4, line 65 to column 5, line 1.

⁵ Yoshioka at column 5, lines 12-36, and Figures 5 and 6.

⁶ Yoshioka at column 5, lines 7-10 and 20-21.

center line 26 based on “the color, configuration and the like.”⁷ Using the location of the guardrail and center line, Yoshioka indicates that excluded areas 16 and 17 of Yoshioka Figure 16 may be determined, and thus obstacles detected in those areas may be ignored.⁸ Thus, according to Yoshioka, locations of a guardrail and of a center line are determined from an image captured by a camera based on a color or configuration, and the locations are used to exclude regions from an area in which obstacles are detected. Thus, Yoshioka fails to teach or suggest detecting a straight line component in *a specific direction* in an image captured by a camera. Accordingly, Applicants respectfully submit that Yoshioka fails to teach or suggest an image processing apparatus but includes “a tracking unit configured to detect a straight line component in a specific direction from each frame in the plurality of frame images,” as recited in independent Claim 9, and as similarly recited in independent Claims 1 and 17.

Accordingly, Applicants respectfully submit that independent Claims 1, 9, and 17, and claims depending therefrom, patentably define over Yoshioka.

Therefore, it is respectfully submitted that independent Claims 1, 9, and 17, and claims depending therefrom, are allowable.

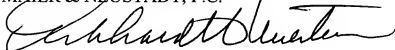
⁷ Yoshioka at column 9, lines 39-44.

⁸ Yoshioka at column 9, lines 44-60.

Consequently, in light of the above discussion, this application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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